An Idiographic Investigation of the Effects of Ability - and Effort-Based Praise On Math Performance and Persistence

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A growing debate exists over the possibility that various types of external rewards may have negative effects on intrinsic motivation. Past research has produced conflicting results. The present study examines past research in light of behavioral principles and utilizes single-subject research methods to examine the potential effects of ability- and effort-based verbal praise statements on mathematics task performance and task persistence. Results of this study do not support the criticism uniformly leveled against external rewards generally or ability-based praise specifically. Limitations and directions for future research are discussed.
Keywords: verbal praise; overjustification effect; external rewards; intrinsic motivation; math performance.

The effects of rewards on task performance, task behavior, and intrinsic motivation have been debated over the past 30 years. As early as 1960, educational theorists warned that using rewards as incentives to promote learning might decrease children's natural curiosity and devalue learning activities and opportunities in children's eyes (Neil, 1960). These warnings appeared to be validated by some experimental work produced in the early 1970's. Deci (1971, 1972) and Lepper, Greene, and Nisbett (1973), for example, demonstrated that rewards could have a decremental effect on the performance of previously highly-preferred tasks. In these and dozens of similar studies that followed, an experimental group was given a reward for the performance of some interesting task while a control group performed the task without reward. Next, intrinsic motivation to perform the task was assessed in a "free-play" session where no rewards were available and subjects could choose from among several tasks, with one being the target activity. If, during the free-play session, the rewarded group spent less time on the target activity than the control group, it was assumed that the extrinsic rewards had undermined intrinsic motivation, a phenomenon labeled as the "overjustification effect" (Lepper et al., 1973).

Although evidence for the overjustification hypothesis has been replicated a number of times, an approximately equal number of studies have failed to replicate it. Thus, there has been considerable debate over the last several decades regarding the accuracy, relevance, limitations, and implications of the overjustification hypothesis in both experimental and applied settings. The rigor of the debate as well as the abundance of research on the subject may most easily be seen in the number of meta-analyses examining the overjustification effect. Deci, Koestner, and Ryan (1999) analyzed 128 studies and concluded that rewards significantly undermined both free choice intrinsic motivation and self-reported interest. Other meta-analyses conducted by Cameron and colleagues (Cameron & Pierce, 1994; Cameron, Banko, & Pierce, 2001) produced findings contrary to Deci et al.'s and went further by pointing out rather significant methodological shortcomings in the often-cited studies which have demonstrated the overjustification effect. For example, use of the term *reward* in place of *reinforcer* in much of the literature may be significant in that rewards are seldom, if ever, empirically identified as reinforcers for the target activity (Cameron & Pierce, 1994). In another meta-analysis, Wiersma (1992) also found the effects of rewards on intrinsic motivation to be inconsistent and asserted that one reason may be methodological differences in the dependent variable of past studies. For instance, when the dependent variable is behavior during a free-time session, the overjustification effect has been demonstrated; however, when the dependent variable is measured as task performance, rewards often served to increase performance. This is an important distinction. From a theoretical standpoint, what cognitive theorists are referring to when they speak of intrinsic motivation may from a behavioral perspective simply be seen as task performance and task persistence. This also has important implications for applied settings as

children in the classroom are typically regarded as successful based on their performance on a task and not because they prefer it over other tasks.

One of the key issues in the debate over the overjustification hypothesis is the definition of intrinsic motivation. According to those who support the theory, intrinsic motivation is said to exist when an individual engages in a behavior in the absence of any known external reward (Deci, 1975). Thus, a behavior is said to be intrinsically motivated when there is no obvious reinforcement contingency in effect. Yet this view fails to take several behavioral principles into account. First, it has been shown that an intermittent schedule of reinforcement may maintain behavior during extended periods of nonreinforcement. In addition, a behavior may be maintained as a result of the behavior itself serving as a conditioned reinforcer (Catania, 1998). We are aware of no studies supporting the overjustification hypothesis in which the authors describe any attempt to discover an existing reinforcement contingency for the target activity, however difficult that may be. Rather, they assume that if the target activity is not directly and intentionally reinforced by the examiner during the initial phase of the experiment, any engagement in that behavior by the subject must be intrinsically motivated. Thus, the learning history of the subjects in these studies is seldom, if ever, taken into account. Warnings to teachers and educational professionals against implementing contingency programs to reward children for specific academic and social behaviors is also particularly puzzling as it is difficult to imagine challenging academic tasks being inherently enjoyable and highly-preferred without taking past learning history into account. In fact, most studies that have examined the effects of rewards on the intrinsic motivation to perform academic tasks did not find a decremental effect (e.g., Vasta & Stirpe, 1979; McGinnis, Friman, & Carlyon, 1999).

A number of studies have examined the relative differences of various types of rewards (e.g., tangible, praise, tokens) on the overjustification hypothesis with mixed findings. Deci (1971, 1972) seemed to suggest that verbal praise would have beneficial effects on task interest and performance, while tangible rewards would undermine intrinsic motivation. Dollinger and Thelen (1978) looked at the comparative effects of tangible, verbal, symbolic, and self-administered rewards. They found that verbal and symbolic rewards did not undermine intrinsic motivation while the other types did to some degree. However, studies cited in Condry (1977) found that both praise and tangible rewards decreased intrinsic motivation. Based on his review of this literature, Morgan (1984) concludes that “any incentive can undermine or enhance intrinsic interest depending on the context in which it is administered” (p. 16).

Within the counseling and cognitive psychology literatures, a great deal has been written on the types of verbal praise and the way praise is to be administered. In addition, there is a widely-held belief among many educators and school professionals that certain types of praise may have a number of negative effects. For example, it has been suggested that praise for *ability* may cause children to develop a “performance goal” rather than a “learning goal” orientation, which is reported to have several undesirable consequences for children (Butler, 1987; Dweck & Leggett, 1988). Dweck and Leggett (1988) linked performance goals to children they termed “helpless”, in contrast to the “mastery-oriented” children who had learning goals. Children with performance goals seemed to view tasks as tests of competence whereas children with learning goals appeared to view tasks as opportunities to increase their competence and acquire new skills. In the realm of observable behaviors, Dweck and Leggett (1988) reported that when faced with a challenging task, children with performance goals may be more likely to report negative self-cognitions, demonstrate negative affect, engage in talking out behaviors, and demonstrate impaired performance. Butler (1987) asserted that feedback or praise that focuses on self-worth and ability rather than on the task itself will eventually undermine both task interest and task performance.

In addition, it has been suggested that praise for intelligence may teach children that ability and intelligence are stable traits that are not amenable to change. Children with this orientation may interpret good performance on a task as a sign of high intelligence and ability, and poor performance as a sign of

low intelligence and ability. Thus, children may make ability attributions for both their successes and failures (Mueller & Dweck, 1998). Negative motivational consequences associated with these ability attributions have been linked by a number of researchers to learned helplessness in the face of failure (Covington & Omelich, 1984; Dweck, 1975; Dweck & Leggett, 1988).

In contrast to ability-based praise, it is said that *effort-based* praise may help children focus on the process of their work and see the possibilities for learning and improvements that hard work may bring. In other words, effort-based praise may lead to learning goals rather than performance goals, which will result in persistence and enjoyment rather than frustration in the face of difficulties (Dweck & Leggett, 1988). In addition, it has been asserted that effort-based praise, like ability-based praise, may also have an attributional effect. However, rather than creating stable ability attributions as ability-based praise is said to do, effort-based praise may result in children attributing their performance to effort, which can vary in amount. Children may thus interpret poor performance as a temporary and correctable lack of effort on their part rather than as a deficit in intelligence or innate ability.

Research regarding the effects of ability- and effort-based praise has produced equivocal findings. Mueller and Dweck (1998) found strong evidence for the differential effects of ability- and effort-based praise on children's achievement behaviors and attributions, with children praised for ability showing less task persistence, less task enjoyment, and poorer task performance. However, other studies have produced conflicting results. Miller, Brickman, and Bolen (1975) found that children praised for their ability improved their math performance more than children praised for effort. Interestingly, in a study examining the effects of praise on task performance, perceived competence, and intrinsic motivation, Koestner, Zuckerman, and Koestner (1989) found that boys performed better after receiving ability-based praise while girls performed better after receiving effort-based praise. In a study utilizing single-subject research methods with seven participants, Weaver, Watson, Cashwell, Hinds, and Fascio (2002), reported that any differential effects found between ability- and effort-based praise were inconsistent and varied by subject. Thus, they found no support for the criticisms leveled against ability-based praise.

The present study was conducted to replicate findings from existing literature and to further research in this area by providing an idiographic examination of the potential effects of ability- and effort-based verbal praise statements on academic task performance and task persistence. Because praise is perhaps the most commonly employed reinforcer in most classrooms, it is important to investigate its effects as a reinforcing stimulus on the individual student's behavior. In addition, it is important to bring this line of research into an applied setting with naturalistic tasks. Most previous research in this area has employed group designs in experimental settings and thus has potentially not only obscured individual differences found within group averages, but limited the generalizability of findings.

Method

Participant and Setting

The subject, Dontae, was a 7-year old African-American male who met Special Education criteria for both Seriously Emotionally Disturbed and a Specific Learning Disability in math. Dontae spent approximately half of his school day (mornings) in a general education classroom and the remainder in a self-contained special education classroom. The intervention took place in the general education classroom.

Design

An alternating treatments design was utilized for this study (Barlow & Hersen, 1984). The order of treatments during each session was randomly sequenced to avoid sequencing effects. A total of 12 sessions was conducted.

Dependent Variables

Two dependent variables were measured: (a) task performance and (b) task persistence. To measure task performance, a math worksheet containing randomly-generated multiplication problems was administered during each five-minute treatment condition. Data were collected on both the number of digits correct and the number of errors during each condition. For all multiplication problems included on the worksheets, one factor was between zero and five. Task persistence was measured as the percent of whole intervals spent on-task during each condition.

Independent Variables

Three five-minute conditions were implemented. During the ability-based condition, verbal praise for *ability* was given (e.g., "I can see you are very good at math"). During the effort-based condition, verbal praise for *effort* was given (e.g., "I can see you're a hard worker"). All statements were made at 30-second intervals, thus 10 statements were made during each condition. During the *control* condition, no verbal statements were made. The order of conditions was randomly sequenced across sessions.

Data Collection

Because Dontae's school-bus arrived at school approximately 30-minutes prior to the first class period, and because this was typically a time that Dontae exhibited behavior problems, it was decided that the intervention would take place immediately upon Dontae's arrival at school. Each session began with five minutes of drill and practice using multiplication flashcards. Following drill and practice, Dontae was given a worksheet containing multiplication problems and was told he would have five minutes to complete as many problems as he could. During this time, praise statements were given if a praise condition was in place, or no statements were made if the control condition was in place. This procedure was repeated so that each of the three conditions was implemented each session. Between conditions, the experimenter and the participant played three games of tic-tac-toe so that the participant could better discriminate between conditions. During each condition, a 10-second whole interval recording procedure was used to measure task persistence on the math worksheet.

Results

Task Performance

Task performance for Dontae is shown in Figure 1. For all conditions, the number of digits correct showed a gradually increasing trend over the 12 sessions. Beginning with 2.2 digits correct per minute for both the ability- and effort-based conditions during the first session, Dontae improved to 15.4 and 16.8 digits correct per minute for the ability- and effort-based conditions respectively during the final session. Similarly, for all conditions, the number of errors gradually decreased over the 12 sessions. Beginning with 6.6 errors per minute during the ability-based condition and 4.8 errors per minute during the effort-based condition during the first session, Dontae improved to 1.2 errors per minute during the ability-based and 0.2 errors per minute during the effort-based condition on the final session. For the control condition, the number of errors decreased from 6.2 per minute during the first session to 0.2 errors per minute during the final session.

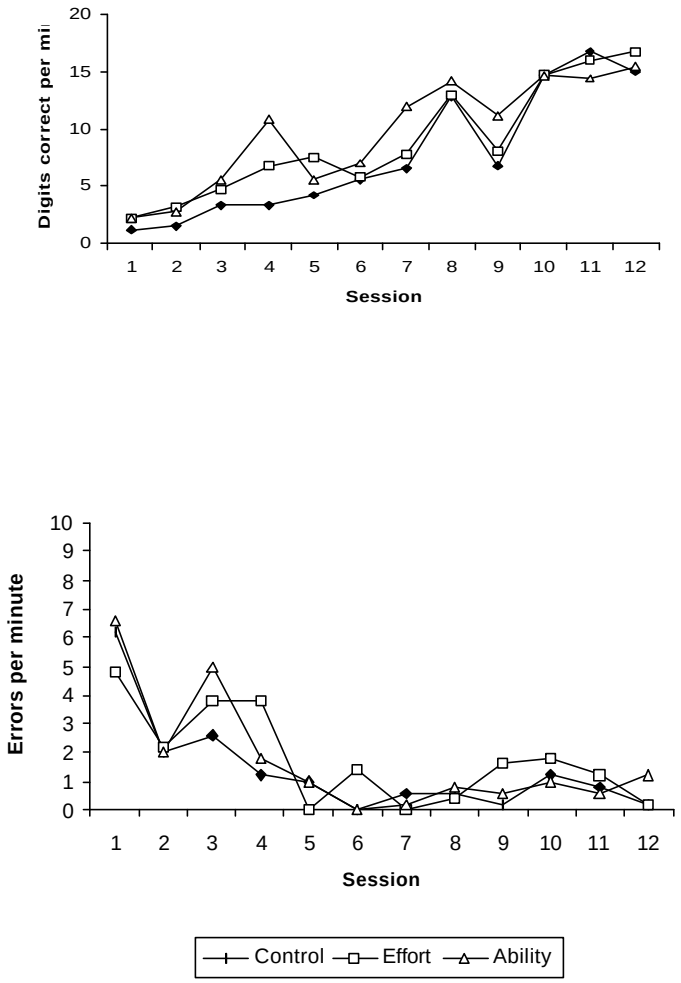

Figure 1. Task performance shown as digits correct per minute and errors per minute across control, effort-based, and ability-based praise conditions.

Although no divergent trend was found between conditions, there was a small degree of separation between the praise conditions and the control condition for digits correct per minute. Out of 12 sessions, only once, during session 11, was there overlap among the series in which math performance for a praise condition fell below performance for the control condition. However, there was considerable overlap among the types of praise. Thus, neither was found to be clearly superior to the other.

Task Persistence

The percent of intervals in which Dontae was on-task is shown in Figure 2. As was the case with task performance, no divergent trend was evident over the 12 sessions. For the two praise conditions, Dontae's on-task behavior was never below 67 percent for all sessions. Although there was very little separation between the two praise conditions, there was some separation between the control condition and the two praise conditions during some sessions. However, as can be seen in Figure 1, this did not always translate to separation between the control condition and the two praise conditions in task performance during those sessions.

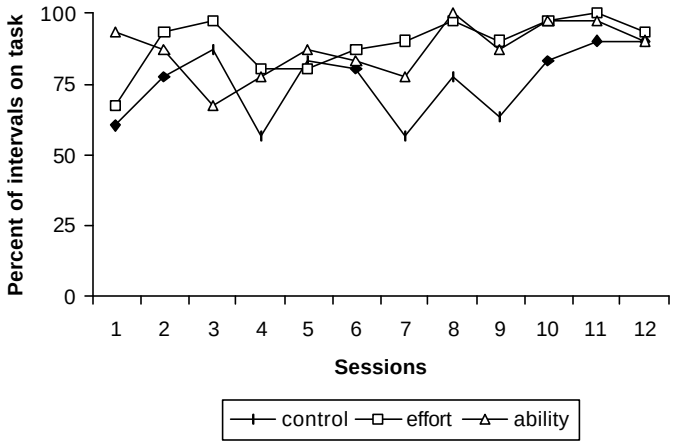

Figure 2. Task persistence across conditions using a 10-second whole-interval recording system.

Discussion

The proposition that external rewards may undermine intrinsically motivated behavior is typically coupled with warnings to teachers and educational professionals against implementing contingency programs to reward children for specific academic and social behaviors. The assumption is that at least some children in the classroom will begin receiving external rewards for behaviors which they had previously engaged in on the basis of enjoyment, and that these rewards, when removed, may lead to a decrease in intrinsic motivation. (Without taking past learning history into account, however, it is difficult to imagine that in a preference assessment, many academic tasks could compete with videogames, socializing with peers, or even free time.) Furthermore, a common perception among many education professionals is that verbal praise for ability may have several negative side effects, including deficits in task performance and task persistence relative to praise for effort. However, in this study, we found no evidence to associate negative effects with rewards generally or verbal praise for ability specifically.

The present study was conducted to build upon a growing body of literature examining the effects of rewards on behavior. Because of the ubiquity of verbal praise in the classroom, it is important to understand how it serves as a reinforcer in comparison to other rewards, especially for positive and appropriate behaviors such as academic tasks. The data in this study show a fairly steady upward trend in digits correct per minute for all three conditions – even during the control condition when verbal praise was not in place. This is not surprising, as we would expect to see somewhat of a carryover effect. As Dontae learned more multiplication facts each session, that learning did not disappear when verbal praise differed according to type or was withheld altogether. Similarly, the number of errors decreased for all conditions through the course of study. As Dontae's math ability improved, the number of mistakes he made decreased regardless of the condition. Although the data show that math performance in terms of digits correct per minute was slightly higher during the two praise conditions than when praise was not given, that small difference may be understood by examining Dontae's on-task behavior. Dontae was typically on-task more during the two praise conditions, thus we would expect that he would perform somewhat better during these conditions.

Because of the lack of divergence and clear separation among the trends, it is impossible to state that one type of verbal praise is superior. Clearly, however, no adverse effects of ability-based praise relative to effort-based praise were noted, as Dontae performed at a similar level during both conditions. Because Dontae also improved when no praise was given, it seems reasonable that overall math improvement was due more to the drill and practice than to various types of praise given.

Because of the general lack of agreement among past studies and because most of these studies have utilized nomothetic research methods rather than single-subject designs, it is difficult to evaluate the consistency of our findings with those of others (e.g., Butler, 1987; Koestner et al, 1989; Miller et al, 1975; Mueller et al, 1998; Schunk, 1996). Previous studies such as those listed above have used inferential statistics to induce general statements about a population from a specific sample of subjects. Studies such as those by Mueller and Dweck (1998) and Butler (1987) have reported negative consequences of ability-based praise. Other studies, such as that by Miller, Brickman, and Bolen (1975) have reported differentially positive effects of ability-based praise. Finally, Koestner et al (1989) found negative effects of ability-based praise for girls and positive effects for boys. Thus, there has been a general lack of agreement regarding the effects of praise for ability and praise for effort on task performance and task persistence.

In contrast to these studies, the present study utilized idiographic research methods in order to determine possible differential effects between ability- and effort-based praise. The only known previous study utilizing similar single-subject research methods to examine these variables (Weaver, Watson, Cashwell, Hinds, & Fascio, 2002) found that differential effects of ability- and effort-based praise were inconsistent and varied by subject. The authors concluded that these differences were most likely due to individual differences among participants and did not support criticisms leveled against ability-based praise.

It would be imprudent to generalize the results of the present study to other participants. It is possible that other participants would have performed noticeably better under one or more conditions. Additionally, it may be possible that one reason past research has produced equivocal findings is that there is no consistent pattern in the population at large. It is highly likely that certain types of verbal praise may serve as an effective reinforcer for task performance and persistence with one child, yet fail to reinforce these behaviors for another child. Parents and teachers are made aware each day of the individual differences in children. Thus, it is important in research, as in practice, to take into account individual differences. The use of inferential statistics does not provide a clear picture of the differences often seen between participants; thus, idiographic methods may be more appropriate for the applied setting than nomothetic methods.

The present study is certainly not without its limitations. First, if children's attributions play such a large role in their performance as some literature suggests, it could be argued that these attributions have already been formed at home and at school and the conditions in the present study did little to change them. In other words, under all conditions of the study, children may have performed based on their already formed attributions rather than on the specific type of praise received in a condition. However, this same criticism could be leveled against much of the past research as well. It could also be argued that no differential effects of ability- and effort-based praise were seen because these treatments were not in place while most learning probably occurred (during the 5-minutes of drill and practice). A more effective methodology may have also included and measured skill acquisition along with performance and persistence.

Future research could build upon the present study in a number of ways. For instance, it would be interesting to see what results would emerge if different academic tasks, as well as non-academic tasks, were used. Future single-subject research examining effects of ability- and effort-based praise, in addition

to other types of rewards, on a variety of tasks would be useful in applying these results to other settings and individuals. Further research exploring the area of matching of rewards may discover that individuals perform best when certain ratios of reinforcers are in place (e.g., three ability-based praise statements and five effort-based praise statements for every tangible reinforcer given). As discussed above, it may also be beneficial to collect data on skill acquisition under various treatment conditions, in addition to task performance and persistence. There are many additional areas of this topic to explore and many questions to be answered. Additional research may indicate that there is a consistent pattern in the population at large, or it may show, as past research has done (Weaver et al., 2002), that while certain behaviors may exist in *most* children, very few exist in *all* children.

References

Barlow, D. H., & Hersen, M. (1984). *Single case experimental designs: Strategies for studying behavior change. (2nd ed.)* Needham Heights, MA: Allyn & Bacon.

Butler, R. (1987). Task-involving and ego-involving properties of evaluation: Effects of different feedback conditions on motivational perceptions, interests, and performance. *Journal of Educational Psychology, 79,* 474-482.

Cameron, J., & Pierce, W. D. (1994). Reinforcement, reward, and intrinsic motivation: A meta-analysis. *Review of Educational Research, 64,* 363-423.

Cameron, J., Banko, K. M., & Pierce, W. D. (2001). Pervasive negative effects of rewards on intrinsic motivation: The myth continues. *The Behavior Analyst, 24,* 1-44.

Catania, A. C. (1998). *Learning* (4th ed.). Upper Saddle River, New Jersey: Prentice Hall.

Condry, J. (1977). Enemies of exploration: Self-initiated versus other-initiated learning. *Journal of Personality and Social Psychology, 35,* 459-477.

Covington, M. V., & Omelich, C. L. (1984). It's best to be able and virtuous too: Student and teacher evaluative responses to successful effort. *Journal of Educational Psychology, 71,* 688-700.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18,* 105-115.

Deci, E. L. (1972). Intrinsic motivation, extrinsic reinforcement, and ineguity. *Journal of Personality and Social Psychology, 22,* 113-120.

Deci, E. L. (1975). *Intrinsic motivation.* New York: Plenum.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125,* 627-668.

Dollinger, S. J., & Thelen, M. H. (1978). Overjustification and children's intrinsic motivation: Comparative effects of four rewards. *Journal of Personality and Social Psychology, 36,* 1259-1269.

Dweck, C. S. (1975). The role of expectations and attributions in the alleviation of learned helplessness. *Journal of Personality and Social Psychology, 31,* 674-685.

Dweck, C. S., & Leggett, E. (1988). A social cognitive approach to motivation and personality. *Psychological Review, 95,* 256-273.

Koestner, R., Zuckerman, M., & Koestner, J. (1987). Praise, involvement, and intrinsic motivation. *Journal of Personality and Social Psychology, 53,* 383-390.

Koestner, R., Zuckerman, M., & Koestner, J. (1989). Attributional focus of praise and children's intrinsic motivation: The moderating role of gender. *Personality and Social Psychology Bulletin, 15,* 61-72.

Lepper, M. R., Greene, D., & Nisbett, R. E. (1973). Undermining children's intrinsic interest with extrinsic rewards: A test of the overjustification hypothesis. *Journal of Personality and Social Psychology, 28,* 129-137.

McGinnis, J. C., Friman, P. C., & Carlyon, W. D. (1999). The effect of token rewards on "intrinsic" motivation for doing math. *Journal of Applied Behavior Analysis, 32,* 375-379.

Miller, R. L., Brickman, P. & Bolen, D. (1975). Attribution versus persuasion as a means for modifying behavior. *Journal of Personality and Social Psychology, 31,* 430-441.

Morgan, M. (1984). Reward-induced decrements and increments in intrinsic motivation. *Review of Educational Research, 54,* 5-30.

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. Journal of Personality and Social Psychology, 75, 33-52.

Neil, A. S. (1960). *Summerhill: A radical approach to child rearing.* New York: Hart.

Schunk, D. H. (1996). Goal and self-evaluative influences during children's cognitive skill learning. *American Educational Research Journal, 33,* 359-382.

Vasta, R., & Stirpe, L. A. (1979). Reinforcement effects on three measures of children's interest in math. *Behavior Modification, 3,* 223-244.

Weaver, A. D., Watson, T. S., Cashwell, C., Hinds, J., & Fascio, S. (2003). The effects of ability- and effort-based praise on task persistence and task performance. *The Behavior Analyst Today, 4,* 127-133.

Wiersma, U. J. (1992). The effects of extrinsic rewards in intrinsic motivation: A meta-analysis. *Journal of Occupational and Organizational Psychology, 65,* 101-114.

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